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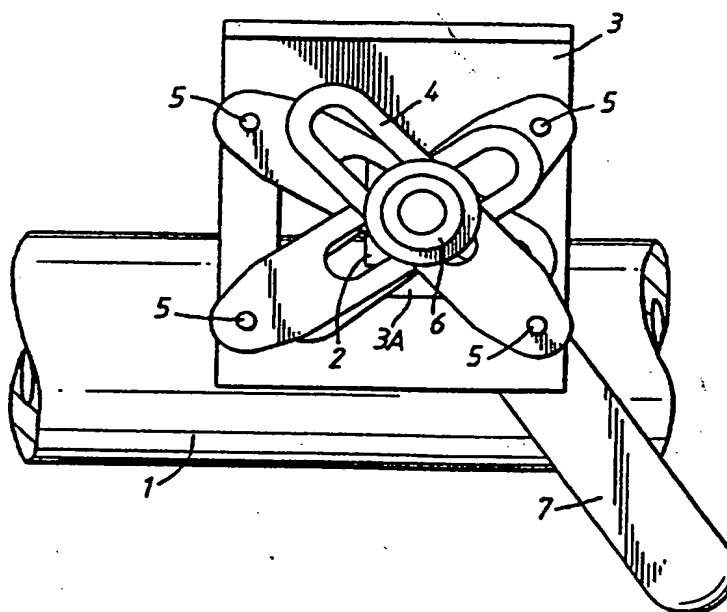
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(54) Title: **ADJUSTABLE VEHICLE STEERING COLUMN ASSEMBLY**



(57) Abstract

An adjustable vehicle steering column assembly including a steering column (1) rigidly joined to a first profiled member (2) of an adjustment limiter to limit travel of the steering column during adjustment. The adjustment limiter also includes a window (3A) through which part of a clamping mechanism, including friction plates (4), passes. In an unclamped state, the adjustment limiter allows free movement of the profile member (2) in the adjustment windows (3A), the friction plates (4) being free to rotate about their mounting pivots (5) and translate along the profiled member (2) of the adjustment limiter, thus allowing free movement of the steering column.

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ADJUSTABLE VEHICLE STEERING COLUMN ASSEMBLY

This invention relates to an adjustable vehicle steering column assembly.

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Adjustable steering column assemblies are known which include a clamping system to clamp the steering column in the desired adjustment location but there is a perceived need to provide a greater range of adjustment travel, whilst allowing for greater control of the envelope limits within which adjustment is permitted.

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A known mechanism is shown in WO 91/06461. Another known construction is shown in GB-A-2 092 967 which is in accordance with the pre-characterising clause of claim 1.

15

According to the present invention, there is provided an adjustable vehicle steering column assembly having a steering column and an adjustment limiter to limit travel of the steering column during adjustment thereof, the adjustment limiter including a first, profiled member, the profiled member being located within a window of a second member of the adjustment limiter, one of said first and second members being joined to part of the steering column and the other of the first and second members being joined to a fixed part of the assembly, the profiled member abutting at least one edge of the window on a limit of adjustment being reached, and there being a clamping mechanism to hold the steering column in the desired adjustment location, and the clamping mechanism including a plurality of elongate, slotted friction plates which are each pivotally mounted at one end, characterised in that the friction plates are arranged to pivot about a plurality of spaced apart pivot points.

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The first profiled member can be joined to the steering column.

5 The second member of the adjustment limiter can form part of a support bracket for the steering column. The profiled member can have a circular profile or can have a polygonal profile.

10 The window of the second member can be substantially rectangular or can have another polygonal shape.

15 In the case where the profiled member is joined to the steering column, the clamping mechanism can pass through the profiled member so that, in an unclamped state of the clamping mechanism, adjustment is permitted and so that in the clamped state of the clamping mechanism, the steering column is held in its desired adjustment location.

20 The clamping mechanism can include a plurality of elongate, slotted friction plates which are each pivotally mounted at one end, the friction plates being arranged to lie across the window of the second member. Another part of the clamping mechanism, being the part that passes through the profiled member, also extends through the slots of the
25 friction members. In the clamped state of the clamping mechanism, the friction plates provide the required clamping force by compression.

30 At least one washer can be provided between one of the friction members and the second member of the adjustment limiter.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:-

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Figure 1 is a diagrammatic side view of an adjustable vehicle steering column assembly having a steering column adjustment limiter,

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Figure 2 is a diagrammatic end view of the assembly shown in Figure 1, and

Figure 3 shows eight of the possible adjustment limit locations achievable with the present apparatus.

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The drawings schematically illustrate an adjustable vehicle steering column assembly including an adjustable steering column 1, which is rigidly joined to a first, profiled member 2 of an adjustment limiter to limit travel of the steering column during adjustment thereof. In the form illustrated, the steering column 1 is adjustable for rake (up/down adjustment) and reach (in/out adjustment) travel.

20

Two steering column support brackets 3 are each provided with a window 3A, which forms a second member of the adjustment limiter.

25

A steering column clamping mechanism includes a set of elongate, slotted, pivotable friction clamping plates 4 (omitted in Figure 3 for clarity), each being mounted on respective pivot pins 5 adjacent one end of each friction plate, respectively.

30

The clamping mechanism further includes a clamping rod 6 passing through the profiled member 2 and the friction plates 4 and coupled to an operating handle 7.

5 By means of a cam lock system or other known device, turning of the handle 7 in a clamping direction causes pressure to be applied to compress the friction plates 4 which lie against the respective faces of the support
10 brackets 3 and it will be seen that this in turn serves to hold the shaft 6 of the clamping mechanism and therefore the profiled member 2 within the respective windows 3A of the support brackets 3.

15 In the form illustrated, there are four friction plates 4 per support bracket 3 and, in addition, washers 8 are provided between the respective two outermost friction plates 4. (The left-hand side only of Figure 2 shows the assembly with the washers 8 but in practice both sides would be provided with them, or not at all - c.f. the
20 right-hand side of Figure 2).

In summary, therefore, in the unclamped state, the adjustment limiter allows free movement of the profiled member 2 in the adjustment windows 3A in the steering
25 column support brackets 3 and the friction plates 4 are free to rotate about their mounting pivots 5 and translate along the profiled member 2 of the adjustment limiter, thus allowing free movement of the steering column.

30 When the steering column clamping mechanism is in its clamped condition, the friction plates 4 and optional washers 8 are compressed, thereby preventing relative movement between the various parts. This therefore holds

the column against rake and reach travel, as well as rotation of the outer steering column.

5 Depending upon the clamped loads required and the clamp force available from the clamped system, the assembly can be tailored to suit. For example, only two friction plates 4 can be provided for each support bracket 3, to as many friction plates as space allows. Coatings can be applied to the friction plates 4 and/or washers 8 to increase clamp 10 friction or decrease unclamped friction as required.

15 The profile of the profiled member 2 of the adjustment limiter can either be round, or, when special control of the adjustment envelope is required, be a custom shape such as the one illustrated in Figure 3. The adjustment windows 3A in the support brackets 3 can be rectangular or can also be given a custom shape. By altering these shapes, one could, for example, allow less upward rake travel when the column is adjusted closer towards the driver. The effect 20 would be to allow a greater range of movement overall, yet limit it in locations where it affects safety in a crash. Figure 3 shows eight locations of the profiled member 2 within one of the windows 3A to illustrate some of the various possibilities of rake and reach orientation of the steering column 1. 25

30 An advantage of the present assembly construction is that a higher clamping force can be achieved for a given torque of the handle 7 and it also allows an increase in the manufacturing tolerances over current assemblies.

The profiled member 2 can be joined to the column 1 by welding, bolting, overcasting or cast as part of the

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brackets 3, for example. The profiled member 2 should be rigidly mounted relatively to the column 1. If the adjustment limiter is non-symmetrical, then the angular position of the member 2 should also be controlled.

CLAIMS:

1. An adjustable vehicle steering column assembly having a steering column (1) and an adjustment limiter to limit travel of the steering column during adjustment thereof, the adjustment limiter including a first, profiled member (2), the profiled member being located within a window (3A) of a second member (3) of the adjustment limiter, one of said first and second members being joined to part of the steering column and the other of the first and second members being joined to a fixed part of the assembly, the profiled member abutting at least one edge of the window on a limit of adjustment being reached, and there being a clamping mechanism to hold the steering column in the desired adjustment location, and the clamping mechanism including a plurality of elongate, slotted friction plates (4) which are each pivotally mounted at one end, characterised in that the friction plates are arranged to pivot about a plurality of spaced apart pivot points (5).
2. An assembly according to claim 1, wherein said first member extends through the friction plate slots.
3. An assembly according to claim 1 or 2, wherein the friction plates lie across the window of said second member.
4. An assembly according to claim 1, 2 or 3, wherein said first profiled member (2) is joined to the steering column (1).
5. An assembly according to any one of the preceding claims, wherein the second member of the adjustment limiter

forms part of a support bracket (3) for the steering column (1).

5 6. An assembly according to any one of the preceding claims, wherein said profiled member (2) has a circular profile.

10 7. An assembly according to any one of claims 1 to 5, wherein said profiled member (2) has a polygonal profile.

 8. An assembly according to any one of the preceding claims, wherein said window (3A) of said second member (3) has a polygonal shape.

15 9. An assembly according to claim 8, wherein said window (3A) of said second member (3) is substantially rectangular.

20 10. An assembly according to any one of the preceding claims, wherein said clamping mechanism passes through said profiled member (2) so that, in an unclamped state of the clamping mechanism, adjustment is permitted and so that, in the clamped state of the clamping mechanism, the steering column (1) is held in its desired adjustment location.

25 11. An assembly according to claim 10, wherein the part (4) of the clamping mechanism that passes through the profiled member, also extends through the slots of the friction plates.

30 12. An assembly according to any one of the preceding claims, wherein at least one washer (8) is provided between one of the friction plates and the second member of the adjustment limiter.

13. A vehicle including an adjustable vehicle steering column assembly according to any one of the preceding claims.

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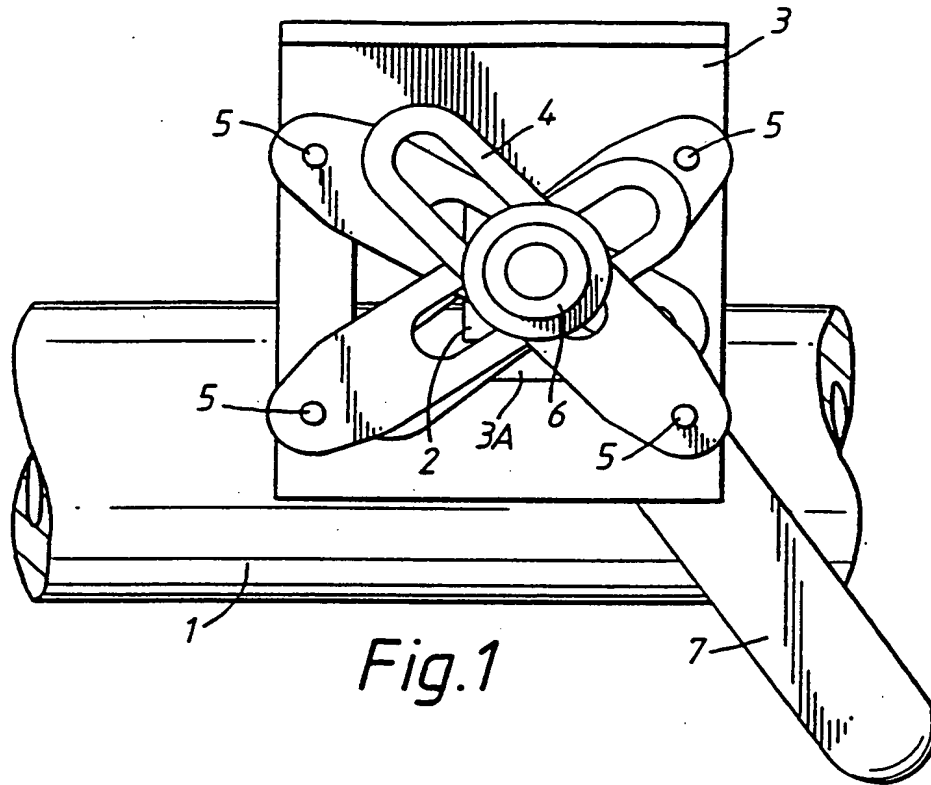


Fig. 1

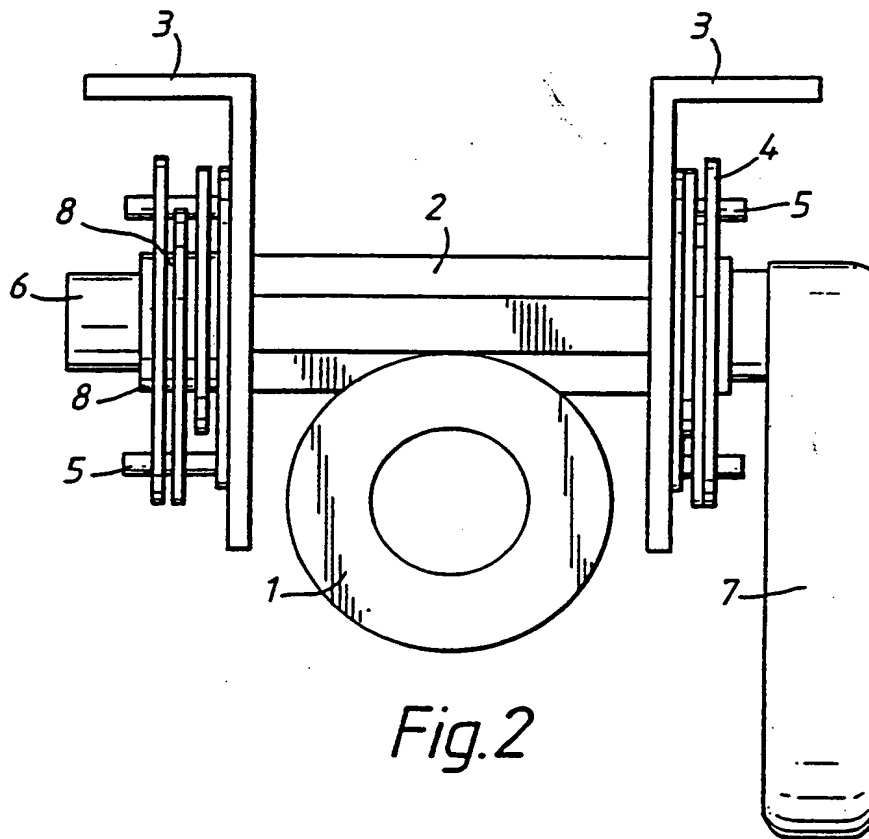


Fig. 2

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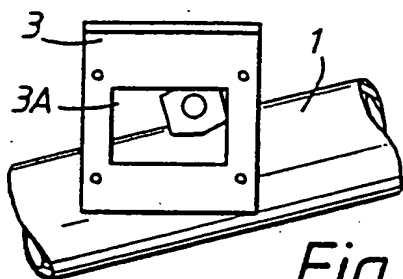


Fig. 3a

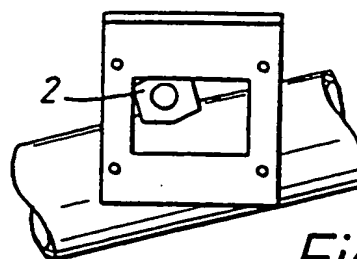


Fig. 3b

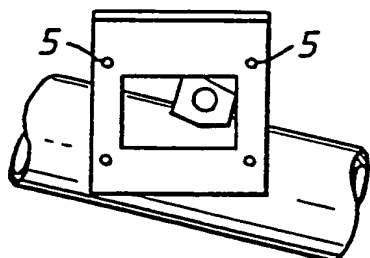


Fig. 3c

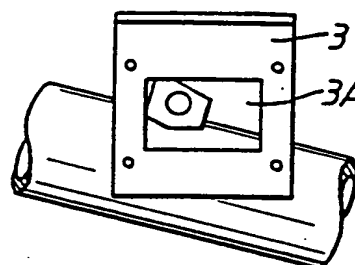


Fig. 3d

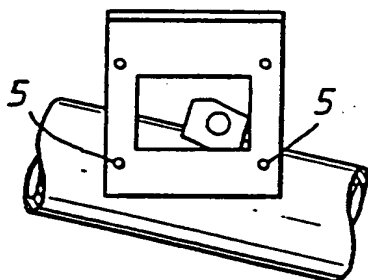


Fig. 3e

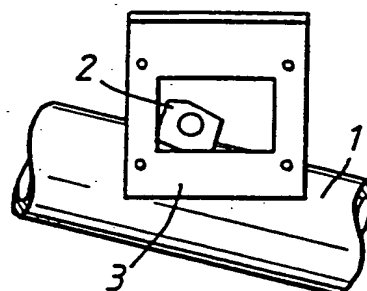


Fig. 3f

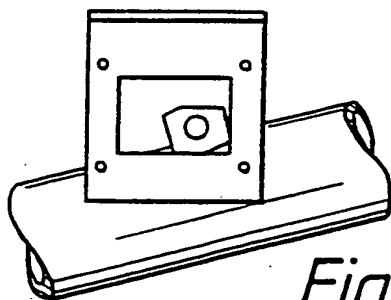


Fig. 3g

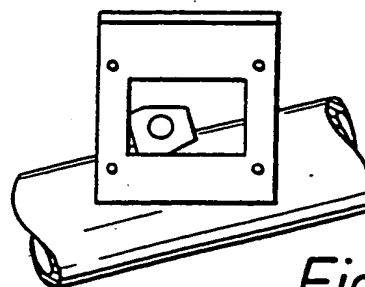


Fig. 3h

INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 96/02616

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 B62D1/18

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 B62D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 2 092 967 A (FORD MOTOR CO) 25 August 1982 cited in the application see page 1, line 99 - page 2, line 116; figures	1-6,8, 10,13
A	EP 0 019 571 A (RENAULT VEHICULES IND) 26 November 1980 see page 2, line 23 - page 4, line 3; figures	1,2,4,6, 10,13
A	WO 91 06461 A (VOLVO AB) 16 May 1991 cited in the application see page 3, line 22 - page 5, line 34; figures	1,2,6, 10,12,13

☐ Further documents are listed in the continuation of box C.

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information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A-2092967	25-08-82	EP-A- 0058495 US-A- 4507982	25-08-82 02-04-85
EP-A-0019571	26-11-80	FR-A- 2456652 AT-T- 3195	12-12-80 15-05-83
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